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**LAUNDRY, COMMISSARY,
MEDICAL, AND SHOP
APPLIANCES
(1933)**



**NAVY DEPARTMENT
BUREAU OF CONSTRUCTION AND REPAIR**

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NOTE.—Chapter 34 of the C. & R. Manual is hereby cancelled.

This pamphlet supersedes chapter 34 and contains necessary instructions on the subjects heretofore contained in that chapter. While this pamphlet is not to be considered as a physical part of the manual, it has been slotted as a matter of convenience for those who may wish to bind it within the covers of the manual.

LAUNDRY, COMMISSARY, MEDICAL, AND SHOP APPLIANCES

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SECTION I. LAUNDRY APPLIANCES

1

(1) It is the policy of the Navy Department to provide laundry **Types furnished**. appliances for all capital ships, cruisers, auxiliaries, and destroyers, and such appliances, conforming to Federal specifications, are issued to vessels by the bureau in accordance with the following table and notes:

Appliance	Colliers, oilers, cargo and store ships		Battleships and tenders		Heavy cruisers	
	Number	Size	Number	Size	Number	Size
(a) Washer	1	36 by 54 in.	1	42 by 72 in.	1	42 by 54 in.
(b) Extractor	1	26 in.	2	30 in.	1	30 in.
(c) Tumbler drier.	40 by 44 in.		1	40 by 64 in.	1	40 by 44 in.
(d) Flat work ironer.	1	16 by 50 in.	1	16 by 50 in.	1	16 by 50 in.
(e) Laundry presses.	1	38 in.	3	38 in.	2	38 in.
(f) Ironingboard.	1	53 in.	1	53 in.	1	53 in.
(g) Stationary washtub.			1	1 compt.	1	1 compt.
(h) Starch cooker			1	15-gallon	1	15-gallon.
(i) Dry room			1	3-draw		
(j) Trunk tubs.			3	22 by 32 in.	2	22 by 32 in.
(k) Collar former and edger.			1		1	
(l) Hot-tube collar shaper.			1		1	

(m) A 24 by 24 inch washer with wringer in accordance with Navy Department specifications is provided for destroyers.

(n) A small washing machine in addition to a 42 by 72 inch washer is furnished to hospital ships.

(o) Laundry marking machines are furnished to hospital ships only.

(p) Combination ironers are no longer furnished, as it has been found that collars, cuffs, and shirts may be more readily handled on laundry presses.

(q) Portable electric hand irons are under the cognizance of the Bureau of Engineering.

(2) The allowance of laundry appliances for other vessels is based upon the complement involved.

Supplies.

(1) Laundry supplies, such as soap, starch, and similar consumable articles, are not furnished by the Government.

Soap powder.

(2) Soap powder shall not be used for laundry purposes as the clothes will be injured. Use powdered soap in accordance with Federal Specifications P-S-596.

Precautions in operation.

The preservation and correct operation of laundry appliances require that the following precautions be observed:

Lubrication.

(1) All bearings and gearing, especially worm gearing, should be examined and lubricated at frequent and regular intervals. Care should be taken to prevent water entering the gear casing on washing machines. To insure this, all gaskets and stuffing boxes should be tight and the water level should not be exceeded.

Safety devices.

(2) Do not attempt to load or unload machines while in motion. Washing machines are provided with means to prevent starting the machine while the door in the outer shell is open. Means are also provided either automatically to stop the machine when the door in the outer shell is opened or prevent the door being opened while the cylinder is in motion. Extractors are fitted with safety covers so arranged that they can not be opened while the basket is rotating and the machine can not be started while the cover is open. All exposed gears and belts are fitted with guards. These safety devices should be maintained in good condition; if removed for any reason, they should be replaced before again starting the machine.

Steam pressure.

(3) Steam pressure should be from 50 to 100 pounds per square inch and never in excess of the latter. Stuffing boxes and steam joints should be kept tight. In case of a leak, turn off the steam and repair any leaks before using the machine. Do not tighten joints or stuffing boxes while steam is on the machine. If sufficient heat can not be maintained in ironing or pressing machines, examine the steam and drain lines for obstructions after cutting off the steam. Do not attempt to increase the pressure above 100 pounds to maintain heat.

Cleanliness.

(4) Cleanliness of machines is essential. Wipe all excess oil and all dirt or moisture from the machines by means of rags or other suitable material. This should be done always at the end of each day. Keep ironing surfaces and padding soft and clean. Care must be exercised if first-class work is expected. Verdigris and soap deposits should not be allowed to accumulate on a washer.

Operation of washer.

(1) Do not admit more water into the washer than specified in the formulas herein nor fill the machine more than specified in Chart No. 1. It is essential that the wash be permitted to drop a considerable distance as it is rotated.

(2) After placing clothing in the washer, securely lock the cylinder doors, as a loose door may wreck the machine. Close the doors in the outer shell and then operate the starting switch.

(3) Carefully carry out instructions regarding number of washings and rinses specified below, together with the amount of water and material required for each for the class of goods being washed.

(4) When the operation is completed, stop the machine at the proper place by means of the "stop" switch. Wait until the cylinder is at rest before trying to open the door in the shell.

(5) If the slightest derangement of the motor or connections is observed, stop the machine immediately.

(6) A uniform hot-water supply of at least 190° F. is desirable. When the temperature of the hottest water available varies from 140° F. to 190° F., variations in washing efficiency must be expected.

(7) Thermometers should be used in the various operations for three reasons:

(a) It is possible to use the most efficient breakdown temperature of 100° F. at the start of the wash.

(b) Better control of suds and rinsing temperatures is possible. This control is especially needed when washing colored lots.

(c) Better control of the temperature of the Javel water operation is secured.

5

Washers should be capable of handling the dry weights of clothes per load in accordance with Chart No. 1 given below.

Weights of loads.

6

All goods should be washed and rinsed in accordance with the four charts given below:

CHART No. 1

SIZE OF LOAD AND WATER LEVELS

(The formulas on these charts are based upon the use of water of zero hardness.)

A

The size of the load is of prime importance, and yet it can not be definitely stated. The best plan is to wash half-yard pieces of white (bleached) cotton muslin 20 times with weighed loads of a given size, repeating the tests and using fresh pieces of cloth with lighter and heavier loads. For example, if the rated capacity of a washer is 200 pounds, wash a sample with twenty 200-pound loads. Repeat the test with another sample of cloth with twenty 175-pound loads and again run the test with 150-pound loads, etc. After a series of tests of this description, the test pieces may be compared with one another and with an original unlaundered piece. The size of load that gives the best results as far as cleanliness and absence of graying or yellowing is concerned should be chosen.

Size of load.

The following maximum loads are given to serve as a guide:

Size of washer	Maximum dry load
<i>Inches</i>	<i>Pounds</i>
36×36	85
36×54	125
42×36	130
42×54	200
42×72	260

It should be remembered that in some cases the above loads are overloads; hence the recommendation that the size of load be determined by actual test. Overloading shows up as gray work and generally is indicated by the excessive amount of rinsing that is necessary.

B

Accurate water-gages are essential in order to prevent waste and avoid poor washing. Too low a water-level means poor penetration of the suds and rinses and incomplete dirt removal. Too high a level means waste and insufficient drop of material being washed. If the float type of gage is used, the float container should be cleaned of lint accumulations at least once a week.

Water levels.

The following water levels should be taken as a basis of operation. They apply to average conditions and may be changed slightly to meet individual plant requirements.

Type of washers	Washing or suds level	Inches	Rinse level
1. Rib-type: a. Bulk washing.....	3	8	
b. Net washing.....	5	10	
2. Y-pocket: a. Bulk washing.....	4	10	
b. Net washing.....	6	12	
3. Small washers: a. Woolens.....	12	12	
b. Silks and rayons.....	5	10	
4. Y-Pocket wool washing.....	17	17	

Add 2 inches to the above washing water levels for the breakdown in the case of all washers handling cotton flatwork and wearing apparel.

Souring generally is conducted at a suds water level; bluing may then follow at a rinse level either in the same bath or in the following one.

C

Washroom notes. 1. Soiled pieces should never be thrown on the floor of the washroom.

2. All pieces should be shaken out before being placed in nets or washers.

3. No load of colored goods should be left partly washed in a washer overnight. Bleeding and marking off of colors are very likely to occur if such a practice is permitted.

4. Nets should not be overloaded. Eight pounds of dry clothes in a 36 by 24 inch net represent sound practice.

5. Bulk and heavy netted work should not be washed together for the following reasons:

(a) Net washing usually requires higher water levels than bulk washing.

(b) Loaded nets may tear fancy pieces, if mixed with bulk work.

6. Rinsing between suds is wasteful and is not recommended.

7. It is important that the nature of the supplies used should be known.

CHART NO. 2

NUMBER OF WASHINGS AND RINSEINGS, COTTON, LINEN, COLORED
GOODS, SILK STOCKINGS

A

First bath: Run in lukewarm water at a temperature of not over 100° F. to a point that is about 2 inches above the designated suds water level. Add soap and builder to produce a light suds, run 5 to 10 minutes, depending upon the type of load, and then discharge the bath. It has been found in certain cases that the addition of extra alkali to the break is advantageous.

Second bath: Add hot water until the required suds water level is reached. Add soap and builder to raise a running suds and run not over 10 minutes. Discharge the bath. After the wheel has run a moment or two, the temperature should approach 125° F. with a good hot-water condition.

Third bath: Add hot water and supplies as above. The temperature ordinarily should equal 140° F. after the bath has run a few moments. Discharge the bath at the end of not over 10 minutes.

Fourth bath: Run in hot water to the designated suds level and add dilute Javel water at the rate of not more than 2 quarts of a 1 per cent solution per 100 pounds of material. Add soap and builder as necessary and run not over 10 minutes. The temperature of this bath ordinarily will range between 155° and 160° F. with a satisfactory hot-water supply.

Fifth bath: When the water-supply contains 1 or more grains of hardness it is advisable to run the first rinse at a suds water level for not over 5 minutes. Otherwise a high rinse level may be used.

Sixth bath: Run a hot rinse at a rinse water level for not more than 5 minutes.

Seventh bath: Repeat.

Eighth bath: Repeat.

Ninth bath: Follow with a warm (130° F.) high rinse for not more than 5 minutes.

Tenth bath: Sour at a suds water level at 120° F. for 5 minutes. Then raise the water to a rinse level with cold water, blue for 5 minutes, and pull the load.

Important: With waters low in alkalinity, one rinse generally may be omitted, providing the washer is not overloaded.

1. If dry soap is added to the break, it is advisable to use a low titer product. With Notes. a liquid soap installation, ordinary tallow soap may be used for the break. It is understood that both soap and builder should be added to the breakdown.

2. For extremely soiled loads, an additional 10-minute suds without Javel water has been used with success.

3. If it is desired, Javel water may be added to the first rinse. The lower temperature that results from bleaching in the suds, however, is an advantage that should not be overlooked.

4. The souring and bluing operations may be conducted in two separate baths, if desired.

5. Collars should be thoroughly rinsed before souring, as otherwise dark spots will develop in the corners. This is especially true of heavy-ply pointed collars.

6. White shirts may be sized in the wheel, in a last bath at a suds water level. Run 10 minutes to thoroughly distribute sizing.

7. The temperatures given for the suds in the above formula are based upon net washing. With bulk washing, due to the use of lower water levels, the temperatures generally will be less, since smaller quantities of hot water will be added to each suds.

B

Lightly soiled white loads.

For lightly soiled white loads a 5-minute lukewarm (100° F.) break and one or two 10-minute suds, Javel water being added to the last suds, should be used. Follow with four hot rinses and one warm one (130° F.) previous to souring and bluing. It is good practice, whenever flat work is laundered every day, to bleach lightly.

C

Light colors (no white areas).

The laundry may handle colored goods having varying degrees of fastness. Whenever it is possible to do so, the light blues and grays should be washed separately from the light reds, pinks, tans, etc., to avoid graying due to the bleeding of the blues, etc. Although pinks, tans, and similar shades sometimes show a tendency to bleed, they usually do not stain the loads nearly so much as does the blue classification. Thermometer control for colored formulas is recommended. For light colored lots with white backgrounds, see under "Colored shirts."

First bath: Add lukewarm (not over 100° F.) water to a point 2 inches or more above the designated suds level. Add soap and builder to produce a light suds and run not over 10 minutes. Discharge the bath.

Second bath: Run in water at 100° F. to a suds water level, add soap and builder to produce a running suds, and discharge the bath at the end of not over 10 minutes.

Third bath: Repeat.

Fourth bath: Repeat.

Fifth bath: When the water supply contains one or more grains of hardness, it is advisable to run the first rinse at a suds water level for not over 5 minutes. Otherwise a high rinse level may be used.

Sixth bath: Use a high rinse at 100° F. for not over 5 minutes.

Seventh bath: Repeat.

Eighth bath: Repeat.

Ninth bath: Run in a cold high rinse and discharge the bath after running not over 5 minutes.

Notes.

1. It is well to remember that, as the temperature of the suds is increased, on the whole, the greater will be the tendency for bleeding to occur. The faster reduction vat printed and dyed materials ordinarily are not affected much by temperature except, possibly, in pastel and similar light tints.

2. Javel water should not be used for this classification of colored goods.

D

Dark colors.

Dark colors should be segregated into different colors and washed separately with a washing formula such as is described under "Light colors." It is especially necessary to separate the blues and blacks from all other colors. Javel water should not be used and the temperature of the suds should never exceed 100° F. Cold-water washing methods may be used, if desired.

E

Colored shirts should be handled by a formula similar to that listed under "Light colors." The temperature, however, may be raised to 120° F. after the breakdown and often is necessary in view of the way in which shirts frequently are soiled. Whenever the predominating color is white, it usually is safe to use suds temperatures as high as 140° F. Such a practice is not advised when solid-shade shirts are included with the striped or checked classifications. Javel water should not be used for this separation. Even though the white areas are cleared up with such a practice, it can be followed only at some risk to the colors.

1. Sizing for shirts may be applied in the last bath. A suds water level should be used **Notes.** and the bath run a full 10 minutes to insure an even distribution of sizing.
2. French cuffs in many cases require special handling. The following methods of treatment are being used by many laundries with varying degrees of success:
 - (a) Dipping the cuffs in hot concentrated soap and builder solution previous to placing the shirts in the washer.
 - (b) Applying soap solution with a soft brush. This practice should be carried out with due regard to the fabrics used and is not recommended for cuffs containing silk or rayon.
 - (c) Sizing the shirts in the washer, when permissible.
3. Shirts containing white areas should be soured.

F

All stockings should be turned inside out previous to washing and **Colored cotton and silk stockings.** the light colors washed separately from the dark.

First bath: Add water at 100° F. until the water level is 2 inches or more above that designated for the suds. Add soap and a small amount of builder and discharge the bath at the end of not more than 10 minutes.

Second bath: Run in water at 100° F. up to a suds water level. Add soap and builder to raise a running suds and then discharge the bath at the end of not more than 10 minutes.

Third bath: Repeat if necessary.

Fourth bath: Run a 100° F. rinse for not more than 5 minutes. Use a suds water level if the water is at all hard.

Fifth bath: Follow with a high rinse at 100° F. for not more than 5 minutes.

Sixth bath: Repeat.

Seventh bath: Repeat.

Eighth bath: Run a cold high rinse for 5 minutes and discharge the bath.

The fastness of colored hose to washing depends largely upon the types of dyestuffs used. To reduce bleeding, the temperature should not exceed 100° F. Wool and part-wool stockings should be handled with the woolens.

CHART No. 3

NUMBER OF WASHINGS AND RINSINGS, MISCELLANEOUS GOODS

A

Overalls.

Colored overalls may be washed successfully with the salt-soda ash formula. The quantities of supplies quoted in the following formula are based upon 100-pound load:

First bath: Add water at 100° F. and run the washer for 5 minutes at 7 inches or more. Builder may be added to greasy loads, as necessary. Discharge the bath.

Second bath: Repeat at 120° F. for 5 minutes and discharge the bath.

Third bath: Add 5 pounds of soda ash and 8 pounds of common salt at a 5-inch water level and run the bath not more than 10 minutes at 135° F. Discharge the bath.

Fourth bath: Run in hot water as before and add 3 pounds of soda ash with 5 pounds of salt. Run the bath not more than 10 minutes at 145° F. and discharge.

Fifth bath: Again add hot water until a 5-inch level is reached and add 1 pound of soda ash and 1½ pounds of salt at 160° F. Run not more than 10 minutes.

Sixth bath: Repeat if necessary.

Follow with three hot rinses and one lukewarm and one cold rinse, all 8 inches high. If it is desired to size overalls in the wheel, after the last rinse has run 5 minutes, reduce the water level to 3 inches and run 10 minutes with starch.

B

White overalls.

White overalls should be handled separately with a soap and builder formula. A four or five suds formula, the breakdown serving as the first suds, generally will be required, followed by the customary rinsing, souring, and bluing operations. The first rinse should be run at a suds water level if the water is at all hard, but the rest should be run at an 8-inch or more level for bulk washing.

C

Uniforms, white service; aprons, coats, and badly soiled towels.

Linen supply, unless greasy and badly soiled, should be laundered with the formula listed under "White cotton and linen wearing apparel and flat work, Chart No. 2," using four to five 10-minute suds, as required.

The following formula applies to bulk-washing methods for greasy work in the rib type of washers:

First bath: Add 5 inches of water at 100° F. Builder may be added if the loads are very greasy. Run 5 minutes and discharge the bath.

Second bath: Add water at 100° F. until a 5-inch level is reached and then add soap and builder to raise a light suds. Discharge the bath after running 5 minutes. In the case of greasy lots, additional builder may be required to assist in emulsifying the grease.

Third bath: Add 3 inches of hot water and sufficient soap and builder to raise a running suds. Further additions of builder may

be made if it proves necessary. Run not more than 10 minutes and discharge the bath.

Fourth bath: Repeat.

Fifth bath: Repeat.

Sixth bath: Run in hot water to raise a 3-inch water level. Add dilute Javel water at the rate of not more than 2 quarts of a 1 per cent solution per 100 pounds of material. Soap and builder should be added as needed and the bath allowed to run not more than 10 minutes. Discharge the bath.

Seventh bath: Add hot water until a 3-inch level is reached if the water contains a grain or more of hardness. Otherwise a high rinse level may be used. Discharge the bath after it has run not over 5 minutes.

Eighth bath: Follow with an 8-inch rinse with hot water for 5 minutes. Discharge.

Ninth bath: Repeat.

Tenth bath: Repeat.

Eleventh bath: Run an 8-inch rinse at 130° F. for not over 5 minutes and discharge the bath.

Twelfth bath: Sour at 120° F. at a 3-inch water level for 5 minutes and then raise the water level to 8 inches with cold water and blue for 5 minutes.

1. If a Y-pocket washer is used for the above classifications, use 7-inch water levels **Notes.** in baths 1 and 2 and 4-inch suds and 10-inch rinses. The first rinse should be 4 inches in height if the water contains any hardness.

2. Bluing may take place in a fresh bath after souring if desired.

3. Uniforms, aprons, coats, etc., that require sizing may be starched for 10 minutes in the last bath at a suds water level.

D

White cotton knit underwear may be handled with a multiple-**Knit underwear.** suds formula such as that used for white cotton wearing apparel. Colored cotton underwear may be washed with a formula similar to that listed under "Light colors." Wool and silk knit underwear should be handled with the wool and silk separations. Part cotton, part wool suits also should be washed with the woolen lots. Tumbling of knit underwear should be avoided whenever it is possible. Especially is this necessary in the case of woolen pieces.

E

If colored woolens bleed in cold water, they should be washed **Woolens.** separately. Fine woolen pieces require hand washing. Every attempt should be made to reduce pounding action to a minimum. The following precautions should be taken when washing any woolen classification:

1. The temperature should not exceed 100° F. for both suds and rinses.
2. High water levels should be used for each bath. (See Chart No. 1.)
3. A neutral soap should be used to raise a very high suds. For badly soiled woolens the addition of a little builder is advised. In case dry soap is used, it preferably should be a low titer powdered product. Liquid soap, if used, may be either a high or low titer product.

4. Washers should remain stationary when being drained and filled.
5. Washers should be operated at low rates of speed.
6. Javel water should not be used for woolens.
7. Tumbler drying of woolens is not advised. Air drying for small pieces should be used whenever possible. Blankets may be dried to advantage on stretchers at temperatures up to 170° F.

Wool wash
formula. 

First bath: Add water at 100° F. or less until a 12-inch water level is reached. Add soap, and builder if necessary, to produce a heavy suds and start the washer. When the suds have been raised, stop the washer and add the load. Start the cylinder and run the bath 5 minutes. Stop the washer, drain, and fill to 12 inches.

Second bath: Start the washer, add soap as needed, and run the bath 5 minutes. Stop the washer, drain and fill to 12 inches. (An additional suds may be used if required.)

Third bath: Start the washer and rinse for 2 minutes. Stop the washer, drain, and fill to 12 inches.

Fourth bath: As above.

Fifth bath: As above.

Sixth bath: After the rinse has run 2 minutes, stop the washer and drain.

Notes.

1. Heavily quilted articles should be washed with a woolen formula, but separately from wool blankets.
2. Sour may be added to the last bath if it is desired to neutralize alkalinity or set any brightly colored pieces that have been dyed with acid colors.
3. When Y pocket washers are used, the suds generally will have to run 10 minutes instead of 5, because of the low washer speed that is used to reduce the pounding action. The rinses should run 2 minutes after the proper water-level has been reached. (See Chart No. 1.)

F

Pillows.

Feather pillows should be washed with a formula similar to that used for woolens. The rinses, however, should run not more than 5 minutes instead of 2. Since the heavy ticking of pillows tends to retard rinsing, some wash men prefer to extract the pillows between the early rinses. All pillows should be washed in closely meshed nets so that the feathers may be saved in case the ticking breaks. Although duck and goose feathers wash nicely, hen feathers are likely to cause trouble.

G

Silks and rayons. Pieces that are composed of silk, rayon, and mixtures of these two fibers should be washed by hand or netted in washers. White pieces should be segregated from the colored ones and naturally light colored silk and rayon articles should be separated from the dark colors and handled at different times, even though the washing formula used may be the same. This practice is necessary in order to avoid any possible bleeding into light colors or white pieces.

Since there is always the likelihood of encountering fugitive shades or tints as well as colors of reasonable fastness to washing, every attempt should be made to control the washing temperature; 100° F. is sufficiently high. A high grade of neutral soap should

be used. Alkaline builders are hardly ever required. If rayon or silk articles are laundered by hand, they should never be twisted or wrung. Rubbing of any sort should be avoided. The shortest possible washing formula should be used. When washers are used, net the pieces and use the formula listed under "Colored cotton and silk stockings," but use no builder. Use 5-inch suds and 10-inch rinses except for the first rinse, which should be 5 inches high if the water contains any hardness.

White cotton-rayon mixtures may be netted and washed at 150° to 160° F. with the white cotton wearing apparel. White cotton-silk mixtures should be netted and handled separately to avoid being damaged by Javel water. Colored cotton-rayon and cotton-silk pieces also should be netted and may be handled with a light color formula, providing Javel water is never used for this classification. Mixtures of wool and rayon or silk should be handled with the woolen lots.

CHART No. 4

STAINS

A

In the following table instructions and suggestions are given as Removal of stains. to the removal of all of the more common types of stains:

Stain	Cotton	Linen	Wool	Silk
Acids.....	Nitric acid sometimes yellows white textiles. Phosphoric acid (frequently present in syrups) yellows wool. The color of many dyed materials is destroyed by acids. Sponge with dilute ammonia or sodium bicarbonate. Rinse well in water afterwards.			
Albumin.....	Removed in the standard washing process.			
Alkalies.....	Alkalies sometimes destroy certain colors. Sponge with dilute acetic acid. Rinse free from acid afterwards. Starch is yellowed by alkalies at high temperatures. Souring will remove such stains.			
Blood.....	Removed in standard washing process. Javel water removes hemoglobin, the red coloring matter. Stubborn stains may be removed with glacial acetic acid. Be careful of colored materials. Rinse well.		Removed in standard washing process. Sponge with a little hydrogen peroxide to remove last traces.	
Bluing: Aniline dyes.	Many of the aniline blue stains will be removed by the standard washing process, if a treatment with Javel water is included. If the stain is not removed treat with sodium bisulfite and zinc dust (put the latter in a cotton sack) or use a warm solution of sodium hydro-sulfite.		Wool and silk should not be blued with aniline blues, since many of the latter are wool and silk dyestuffs. To remove such stains, treat with potassium permanganate. Allow to stand five minutes and remove pink or brown stain with hydrogen peroxide. Or use sodium bisulfite and zinc dust or sodium hydrosulfite.	
Prussian blue.....	Fresh stains may be removed by washing in clear water. If the blue has come in contact with alkalies, however, the spots are changed to ferric oxide (iron rust) and may be removed by treatment with oxalic acid or with sodium acid fluoride. Rinse well afterwards.			
Ultramarine.....	Generally removed in the standard washing process. If the stains are not removed completely, a treatment with a sour will decompose them.			

Stain	Cotton	Linen	Wool	Silk
Chewing gum	Spot with carbon tetrachloride, then wash by hand with soap. Rub well.			
Cocoa and chocolate.	Removed in the standard washing process.			
Coffee	Removed in the standard washing process.			
Cream and ice cream.	Removed in the standard washing process.			
Dye:	When a multicolored fabric has bled or run and the white portion has become colored, it is sometimes possible to remove the stain without affecting the original pattern. Small samples should be tested first, as everything depends on fastness of the ground colors. Potassium permanganate followed by oxalic acid or sodium bisulfite sometimes proves satisfactory. Sodium bisulfite and zinc may sometimes be used. A mixture of one part ammonia in four parts alcohol is often effective. This may be used hot or cold. Hydrogen peroxide is suitable in certain cases, followed by ammonia. Javel water works only in a few instances, as most colors are destroyed by hypochlorites.		In the case of wool and silk, the same methods that are recommended for cotton and linen may be used. Potassium permanganate should be followed by sodium bisulfite, however. The ammonia-alcohol mixture has its use here as well. Hydrogen peroxide may be used, but not Javel water. Often dye stains are caused by trimmings bleeding. In this case soak the garment in clear cold water for an hour or so. The dye stain is sometimes removed.	
Bleeding of a colored garment in a load of white goods.	When a load of white goods has been stained from contact with a sock or colored material, a treatment with permanganate or with sodium bisulfite and zinc generally removes the stain. A hydro-sulfite also is satisfactory when used according to manufacturers' directions. Rinse well to remove all traces of the reagents. In the case of white cotton and linen, Javel water sometimes is effective.			
Hat dye	Soak in 95 per cent ethyl alcohol. Rinse in a clean portion of alcohol and launder as usual. Slight stains remaining after this treatment may be treated as directed above.			
Egg	Removed in the standard washing process.			
Flower stains	Sponge with warm ethyl alcohol.			
Fruit	Removed in the standard washing process.		Try the following order: Warm water, warm alcohol, and glacial acetic acid. If this treatment is not successful, try potassium permanganate followed by oxalic acid, sodium bisulfite or hydrogen peroxide.	
Gelatin or glue	Generally removed in the standard washing process. If not, they may be removed by treatment with glacial acetic acid.			
Grass	Removed in the standard washing process. Javel water bleaches last traces.		Treat with a mixture in equal parts by volume of 95 per cent ethyl alcohol and ethyl ether.	
Grease	Grease stains are usually removed in the standard washing process. If an exceedingly resistant stain is encountered, it may be softened with a mixture of lard and oleic acid (2 parts oleic acid to 98 parts of lard) and washed. When the oleic acid comes in contact with the soda ash in the usual bath, soap is formed, and being in such intimate association with the grease, removes it rapidly.		Stains surviving the regular laundering process must be treated with an excess of soap by hand or with one of the organic solvents, such as gasoline, carbon tetrachloride, chloroform or ethyl ether. Remember that most organic solvents are extremely inflammable.	

Stain	Cotton Linen	Wool Silk
Gum or resin.....	Use any of the following solvents: Turpentine, benzine, carbon tetrachloride, chloroform, 95 per cent ethyl alcohol, ethyl ether, kerosene, gasoline, or carbon disulfide. The specific solvent must be determined by actual test, since the solubility of different gums varies.	
Ink: Aniline black.	It is practically impossible to remove such a stain.	
Black printing.	Coloring matter consists of finely divided carbon. Generally removed in the standard washing process. The stain may be loosened by greasing it well with lard previous to laundering.	
India.....	See Black printing ink.	
Iron, ordinary writing.	Treat with warm acetic oxalic acid mixture, oxalic alone, or sodium acid fluoride. Ordinary writing inks sometimes are mixtures of iron inks and aniline dyes. (To remove ink stains of this nature see "Bluing" and "Dyes.")	
Silver nitrate.	Soak in sodium thiosulfate solution until the stain disappears, or treat with Javel water until stain is removed, soaking in a weak solution of ammonia to remove the silver chloride formed. (If this precaution is omitted the stain will reappear.)	Treat with potassium cyanide solution (a deadly POISON).
Indelible pencil.....	Removed in the standard washing process. Remaining traces may be removed with Javel water or with potassium permanganate followed by oxalic acid.	Soak in 95 per cent ethyl alcohol or potassium permanganate followed by oxalic acid. The mineral matter will wash out.
Iodine.....	Spot with dilute sodium thiosulfate solution and rinse thoroughly.	
Iron.....	May be removed by oxalic acid or sodium or ammonium acid fluoride solutions.	
Lead pencil.....	Usually removed by the standard washing process. Organic solvents sometimes help.	
Leather.....	Light stains are removed in the standard washing process. Deeper stains may be treated with Javel water.	Sodium pyrophosphate (made up 1 ounce to 16 ounces of water) may be used both for leather and artificial leather stains.
Machine oil.....	The oily stain may be removed after the manner described under "Grease." If the stain is caused by bearing grease, it may contain some iron or other metal. See under "Iron."	
Medicines: Organic.....	Generally removed in the standard washing process. Javel water may be required to remove a heavy medicinal stain. Warm alcohol frequently removes medicinal and perfume stains.	Stains not removed in the standard washing process may be treated with potassium permanganate followed by oxalic acid or sodium bisulfite.
Containing salts of heavy metals like iron, silver, etc.	Iron stains of this type may be treated as under "Iron." Argyrol and other silver stains may be removed by treatment in a solution of potassium cyanide (POISON).	
Mildew and mold.	Fresh, light stains are removed by the standard washing process. Old stains may be treated with Javel water.	Potassium permanganate followed by hydrogen peroxide. Soap and water are satisfactory in very light cases.
Mud.....	Removed in standard washing process. If an iron residual stain persists, remove as usual with oxalic acid or sodium or ammonium acid fluoride. Rinse well.	

LAUNDRY APPLIANCES

Stain	Cotton	Linen	Wool	Silk
Paint and varnish.	These stains are more easily removed if treated before being laundered. Rub oleic acid into the stain. This is very important, especially for heavy stains. Then soak in an oleic acid-benzine mixture overnight (1 part oleic acid to 3 parts benzine). In the morning wash the material well in hot soda ash solution. The soda ash reacts with the oleic acid to form a "red oil" soap.		Use the following solvents: Turpentine, benzine, carbon tetrachloride or chloroform.	
Perspiration.	If not removed in the standard washing process, treat with Javel water or with potassium permanganate solution followed by oxalic acid.		If the stain does not wash out, use potassium permanganate solution followed by oxalic acid.	
Scorch.	If not removed in the washing process, soak in mixture of 1 part oleic acid, 2 parts carbon tetrachloride and 2 parts alcohol, overnight if necessary. Then wash out the next morning in hot soda ash solution. Also useful for removing stubborn grease stain.		Treatment with permanganate solution will partially restore scorched silk and wool, but a heavy scorch can never be removed.	
Shoe polish.	Generally removed by standard washing process. Some black pastes contain turpentine. Spot with latter. Others contain nitrobenzine. Use nitrobenzine in this case. Nitrobenzine requires careful handling, since it affects some dyestuffs.			
Stove polish.	If not removed by standard washing process, spot with chloroform, gasoline, carbon tetrachloride or other organic solvents.			
Sirup.	Sugar is removed in standard washing process. Fruit sirup stains remaining after this treatment should be treated as under "Fruit." Since many sirups contain phosphoric acid, yellow spots occur on wool stained from such a source.			
Tarry matter.	See under "Paint."			
Tea.	Tea stains are usually removed in the standard washing process.		If not completely removed by the washing process, spot with hydrogen peroxide or with permanganate solution followed by oxalic acid.	
Tobacco: Extract.	Stains that are not removed by regular washing process may be treated with Javel water or with potassium permanganate followed by oxalic acid.		Sponge with 95 per cent ethyl alcohol after laundering. Hydrogen peroxide and permanganate solution may be used to treat last traces.	
Tarry residues from pipes.	See under "Paint."			
Tumeric and other food dyes.	Usually removed during washing. If not, treat with Javel water or potassium permanganate followed by sodium bisulfite solution. Some food dyes are resistant to such treatment, in which case amyl alcohol should be used.		A stain that resists the laundering process may be treated with hydrogen peroxide or potassium permanganate and sodium bisulfite. Residual stains may also be removed with amyl alcohol.	
Vaseline.	See under "Wax."			
Verdigris.	Verdigris is a basic copper carbonate. Fresh stains are generally removed during the washing process. Older stains require treatment with dilute hydrochloric (muriatic) acid. Rinse well following such a treatment.			
Wax: Paraffin and other waxes.	These substances must be sponged with a suitable organic solvent (gasoline, chloroform, benzine, etc.), or placed between 2 layers of clean blotting paper and pressed with a warm iron. The blotting paper removes the paraffin by capillary attraction after heat has melted it. If the wax has been colored, remove as much as possible and sponge with alcohol. Boiling soap solutions may be used for white cotton pieces.			
Stubborn stains.	It has been observed that several hours boiling in a concentrated soap solution has removed stains that could be eliminated in no other way. Use this treatment as a last resort for white cotton pieces and fast colors. It is not suitable for woolens or colored silks, but may be used for white silks.			

CHART No. 4

B

PREPARATION OF SOLUTIONS FOR USE IN ABOVE TABLE

1. *Ammonia*.—The ammonia sold by druggists is about a 10 per cent solution; dilute 1 volume with 9 volumes of water before using.

2. *Acetic acid*.—Dilute 1 volume of 56 per cent acetic acid with 9 volumes of water.

3. *Hydrogen peroxide*.—Use the pharmacopoeial grade, full strength.

4. *Oxalic acid*.—Dissolve 1 ounce of acid in a gallon of water.

5. *Javel water or bleach*.—Bleaching solution containing 1 per cent of available chlorine may be prepared in accordance with one of the following formulas:

(1)

(2)

30 gallons of water.

30 gallons of water.

11½ pounds soda ash (58 per cent Na_2O).4.3 pounds caustic soda (76 per cent Na_2O).

3.8 pounds of liquid chlorine.

3.8 pounds liquid chlorine.

Bleach solution should be used within two days after it has been prepared. Bleach should be kept in an earthenware crock of good depth as shallow solution permits gas to readily escape from the surface of the liquid.

6. *Potassium permanganate*.—Dissolve an ounce in a gallon of water. A stronger solution may "tender" the fabric.

7. *Magnesium sulfate*.—Dissolve an ounce in a gallon of water.

8. *Sodium bisulfite*.—Prepare a saturated solution by adding the crystals to water until no more will dissolve. Where zinc is used in conjunction with it, the zinc should be in powdered form and contained in a cotton bag to prevent its getting into the fabric.

9. *Potassium cyanide*.—Dissolve an ounce in a gallon of water. After using, throw the solution away at once and rinse thoroughly. Remember that it is a DEADLY POISON.

10. *Starch*.—Assume that a batch of 10 gallons of starch is to be prepared containing 9 to 11 ounces of starch to the gallon. Weigh out the desired amount of starch and place it in a container to which may be added sufficient water to work the mixture, first into a thick paste, and then, by addition of more water, into a very thin paste. The paste should be strained through a fine mesh screen or cheese cloth. Sufficient water should then be added to the strained paste to make about two-thirds of the desired final volume. To this mixture add about $\frac{1}{4}$ ounce of borax and then boil the solution. When the boiling is completed, add 1 ounce of 56 per cent acetic acid and continue to stir until the solution is cooled to room temperature, then add the desired amount of cold water. When acetic acid is added to starch as prescribed, the collars must be blued only very lightly in the machine or the finished collars will be too blue because the acetic acid in the starch helps to bring out the full effect of the blue.

C

Notes on stains. 1. The methods recommended for white goods are equally effective for colored goods, *provided that the reagents used have no effect on the color of the material.*

2. Tests should always be made on some hidden portion of the garment before the reagent is applied to the stain.

3. Always remember that heat sets certain types of stains such as blood, sirups, drying oils, etc. Stains are much more easily removed if they are treated when fresh.

4. When treating stains, start with the simplest operations, since certain reagents set stains, rendering it impossible to remove them.

5. When using potassium permanganate solution, use an equal amount of magnesium sulfate in conjunction with it. Caustic potash is one of the products formed when stains are treated with permanganate. Magnesium sulfate reacts with caustic potash as soon as it is formed and prevents the textiles from being injured.

6. The reagents used in spotting must be completely removed from the fabrics or there sometimes is danger that they will attack the material.

7. It should be remembered that, although the bulk of stains may be removed by laundering and others may be removed by special treatment, nevertheless there are some stains that can not be removed without destroying the fibers themselves.

8. Be extremely careful of flames when using ether, chloroform, or gasoline.

9. Carbon tetrachloride is noninflammable.

10. Any stains on sick-bay clothes should be removed by hand washing before delivery to the laundry. If not removed, the clothes should then be washed separately. All sick-bay clothes should be soaked in cold water before being placed in warm water.

11. Always endeavor to arrange a full load, using nets if necessary. It takes as much water to run a small load as a full one.

12. Before taking white goods from the washer, be sure the extractor is clean.

13. After extracting officers' and chief petty officers' clothes shake out and sort clothes into piles of—

- Starched goods, such as shirts, collars, and cuffs.
- Soft goods to be ironed by press.
- Soft goods to be mangled.
- Soft goods to be neither ironed nor mangled, such as regulation undershirts and bath towels.

7

Operation of extractors.

- (1) Never overload the extractors. It is injurious to the machinery and may prove dangerous to the personnel.
- (2) When loading the extractor put but few clothes in the basket at a time, placing them symmetrically, and packing them so that no piece will shift its position or become dislodged.
- (3) The heavy pieces, if possible, should be placed at the bottom of the basket and wound around uniformly.
- (4) Loose ends are not to be left hanging out. As the machine is being loaded, move the basket around and firmly press the goods well out against the side.

(5) When the extractor is properly loaded, there should be a clear space in the center, permitting the operator to see the nut in the bottom of the basket. This space is necessary for proper circulation of air.

(6) Cover the clothes with a piece of heavy cloth or canvas and close the safety cover.

(7) If, after starting, the extractor is seen to be unevenly loaded, stop and reload it.

(8) After extracting dyed clothing, clean the basket carefully before using it again.

(9) If the slightest derangement of the motor or connections is observed, stop the machine and report the fact.

(10) The extractor should remove two-thirds of the water. Whether it is doing this or not may be determined by weighing the goods before extracting, then afterwards, and finally after the goods have been ironed.

(11) If the goods are left in the extractor for the time specified it will not be necessary to dry articles such as sheets, table linen, and uniforms in the tumbler or dry room. These goods may be removed from the extractor and ironed at once.

(12) Extractors should be operated for about 15 minutes average time per load, except for woolen clothing and blankets, which should be extracted for 5 minutes. Extractors should not be loaded in excess of the following corresponding weights for the conditions specified:

Size of extractor	Total load when wet	Dry weight before being washed		Dry weight after being ironed
		Pounds	Pounds	
30 inches.....		200	50	70
26 inches.....		114	28.5	40

(13) The bumper ring on extractors performs the very important function of preventing undue motion of the basket so that the basket and curb do not come in contact. Bumper rings should be examined weekly to insure their satisfactory condition and functioning.

(14) The baskets should be carefully inspected at intervals of not more than six months for possible defects, particularly with reference to the strengthening bands, in view of the high stresses imposed under operation at high speed. It has been found in service that rust may accumulate between the bands and the basket in such a way as to give the deceptive appearance of a double band in good condition, whereas the actual sound metal may be greatly reduced in effective area and strength by progressive corrosion. Special care is necessary to detect this condition. Prodding, scaling, and such other steps as are practicable should be taken to ascertain the condition of the strengthening bands. Should doubt arise as to the condition of the basket and strengthening bands, steps should be taken to obtain a new basket. On recent extractors the baskets and reinforcing bands are of corrosion-resisting metal.

Operation of tumbler dryers.

(1) Before placing material in the tumbler for drying let the cylinder and fan run empty for a few minutes to draw out all dust and dirt from the inside of machine.

(2) In loading or unloading the cylinder never fail to lock it with the brake on the main drive. Do not fail to release the brake before starting.

(3) To obtain the best results do not overload the cylinder. If the goods are packed in the cylinder so tightly that they can not tumble, the purpose of the machine is defeated.

(4) For quick results and satisfactory work, extract goods thoroughly in extractors, as the more water that is extracted the less there is to vaporize.

(5) If the machine can not be kept busy drying goods, turn off the heat and use the machine as a shaker for flat work. It will not only shake out wrinkles, but will remove the lint from the goods.

(6) Flat work taken from the tumbler may be ironed by running it through the mangle but once.

(7) Underwear taken from the tumbler does not require ironing, as it may be smoothed out by hand and folded.

(8) To clean screens in lint compartment, first stop the fans and cylinder, as it is advisable not to remove screens while the fans and cylinder are in operation.

(9) By lifting one screen at a time the lint may be quickly removed by rolling it off the screen, beginning at the top. When the screens are clean, see that they are replaced carefully and not permitted to lie loose on the frame, or inadvertently left out of the machine.

(10) Handle screens with care, as it is important to keep them in good condition and avoid holes that will permit the lint to pass into the fan and coil compartment.

(11) Lubricate all bearings frequently.

Operation of laundry press.

This machine is intended primarily for ironing collars, cuffs, shirts and uniforms. When ironing collars and cuffs be sure that the padding is unusually thick. Place the outside of the collars or cuffs against the padding and apply the heated head for a very short time, then reverse the collar so that the outside will come in contact with the heated head. Apply the head until the collar is dry. After a little practice satisfactory results may be obtained.

Collar former and edger and hot-tube shaper.

After the collars are ironed on the laundry press they should be formed and edged on this machine and then placed in the hot tube collar shaper.

11

(1) Dry rooms are intended for drying starched goods, such as **Dry rooms**, collars, cuffs, and stiff shirts so as not to break the starch.

(2) White goods, if properly handled in the extractor, do not require being dried in the dry room.

12

The ironing board should be used to put finishing touches on portions of goods, such as shirts, which may not be readily done on machines. The use of the hand irons should be limited as much as practicable in order to expedite work. The flatwork ironer and laundry presses are capable of handling practically all ironed goods.

SECTION II. COMMISSARY APPLIANCES

13

The Bureau of Construction and Repair supplies commissary appliances generally as listed below, the number, type, and capacities being subject to modification in some instances due to conditions on individual vessels or classes of vessels:

(1) For crew's galley:

(a) Blocks, meat—

Where butcher shop is not provided, one 30 by 30 by 16-inch block for vessels of 2,000 tons or more displacement; one 24 by 24 by 16-inch block for destroyers and other vessels under 2,000 tons displacement.

(b) Kettles, steam-jacketed, coffee—

Standard sizes, 20, 40, 60, and 80 gallons. Volume allowance, 20 gallons per 100 men. Transports, 12½ gallons per 100 troops.

(c) Kettles, steam-jacketed, vegetable—

Standard sizes, 20, 40, 60, and 80 gallons. Volume allowance, 50 gallons per 100 men. For transports, 25 gallons per 100 troops.

(d) Kitchen and cake machines, 80-quart, electric—

One for complement of 300 or more; two for capital ships and carriers if galley and bakery are not adjacent.

(e) Kitchen and cake machine (80-quart) with meat chopping attachment, electric—

One for auxiliary vessels with complement of 100 to 300.

(f) Meat chopper, electric (for galley or butcher shop)—

One for complement of 250 or more, but not when meat chopping attachment is furnished on kitchen and cake machine.

(g) Meat, bone, and fish cutter, electric (for galley or butcher shop)—

One for capital ships, carriers and heavy cruisers.

(h) Meat slicer, electric (for galley or butcher shop)—

One for capital ships, carriers and heavy cruisers.

- (1) For crew's galley—Continued.
 - (i) Potato peeler, electric (for crew's galley or potato peeler room)—
 - One 15-pound for 100 to 200 complement when specifically approved.
 - One 25-pound for 201 to 500 complement.
 - One 50-pound for 501 to 1,000 complement.
 - Two 50-pound for over 1,000 complement.
 - (j) Ranges, electric—
 - One 3-foot or 3½-foot section per 100 men.
 - One submarine type per 35 men, for submarines.
 - One 3½-foot section per 500 troops, for transports.
 - One section assigned to chief petty officers where practicable.
 - (k) Ranges, oil-burning—
 - Eight square feet of top cooking surface per 140 men.
 - Eight square feet of top cooking surface per 500 troops, for transports (additional).
 - One section assigned to chief petty officers where practicable.
 - (l) Urns, coffee, electric—
 - One 4-gallon per 35 men, for submarines.
 - (m) Water tanks, hot, electric—
 - One for submarines.
- (2) Officers' galley:
 - (a) Ranges, electric—
 - Except for destroyers and small ships, each wardroom, junior officers' and warrant officers' mess, one 3½-foot or 4-foot section for each 50 officers. In addition, on transports, one 3½-foot section for each 50 passengers or part thereof, served from the officers' galley.
 - (b) Ranges, oil—
 - One range with about 8 square feet of top cooking surface for each mess for each 50 officers or part thereof.
 - On transports, one range for each 50 passengers or part thereof served from officers' galley.
- (3) Bakery:
 - (a) Dough mixer, electric—
 - One 1-barrel for complement of 300 to 500.
 - One 2-barrel for complement in excess of 500.
 - Transports—
 - One 1-barrel for 1,000 to 2,499 troops.
 - One 2-barrel for 2,500 or more troops.
 - (b) Bake ovens—
 - One No. 1, oil or electric, for each 550 officers and men.
 - One No. 2, oil or electric, for each 350 officers and men.
 - One No. 3, oil, for each 175 officers and men.

(3) Bakery—Continued.

(b) Bake ovens—Continued.

None allowed destroyers and small vessels having complement of less than 175.

For transports, one No. 1 for each 1,000 officers and men.

(c) Proofer, steam—

One No. 1 for each No. 1 oven.

One No. 2 for each No. 2 or No. 3 oven.

(d) Dough trough—

One for complement of 175 to 750.

Two for complement of 751 to 1,000.

Three for complement over 1,000.

Transports, one for each bake oven.

(4) Butcher shop:

(a) Block, meat—

One, 35 by 50 inches for large vessels.

One, 30 by 30 inches for small vessels.

(b) Meat chopper, electric—

If not installed in crew's galley, one for complement of 250 or more.

(c) Refrigerator, electric—

One No. 1 with one large door.

(d) Tables, meat cutting—

One.

(e) Meat, bone, and fish cutter, electric—

If not installed in crew's galley, one for capital ships, carriers and heavy cruisers.

(f) Meat slicer, electric—

If not installed in crew's galley, one for capital ships, carriers and heavy cruisers.

(5) General mess pantry.

(a) Dishwashing machine—

One 2-tank machine for complement of 300 or more.

(b) Dish-sterilizing machine—

One for complement of 300 or more.

(c) For large destroyers—

One single-tank dishwashing machine and one tank with steam coil for sterilizing dishes.

(d) For other destroyers—

One tank with steam coil for sterilizing dishes.

(e) Dishwashing baskets—

Two plate baskets, 1 cutlery basket, 2 cup baskets, and 2 bowl baskets for each mess (20 men) plus 5 per cent for spares.

(6) Potato peeler room:

One potato peeler. For capacities, see "Crew's galley."

(7) Emergency cabin:

One disk stove, 8-inch, electric.

(8) Diet kitchen:

One electric range, domestic type.

One electric refrigerator.

One expressor for beef juice.

(9) Sick bay:
One electric combined biological refrigerator, No. 3, and drinking fountain.
One disk stove, 8-inch, electric, when diet kitchen is not provided.

(10) Flag officer's or captain's pantry:
One electric refrigerator No. 2.
One small steam table.

(11) Wardroom officers' pantry:
(a) Except for destroyers, submarines and small vessels, one electric refrigerator, No. 2, for 15 officers or less, No. 1 for 16 to 25 officers.
(b) For destroyers, one No. 2 electric refrigerator and one warming oven, electric, about 18 by 18 by 14 inches.
(c) One or more steam tables.
(d) One 5-gallon steam-heated coffee urn for from 20 to 50 officers; two 5-gallon urns for over 50 officers.
(e) For capital ships, carriers and heavy cruisers, one single-tank dishwashing machine and one dish-sterilizing tank.

(12) Junior officers' pantry:
(a) One electric refrigerator, No. 2 for 15 officers or less, No. 1 for 16 to 25 officers.
(b) One or more steam tables.
(c) One 5-gallon steam coffee urn for from 20 to 50 officers.
(d) Two 5-gallon steam coffee urns for over 50 officers.

(13) Warrant officers' pantry:
(a) One electric refrigerator—No. 2 for 15 officers or less; No. 1 for 16 to 25 officers.
(b) One small steam table.
(c) One 5-gallon steam coffee urn where more than 20 officers.

(14) Chief petty officers' pantry (except for submarines and small vessels):
(a) One electric refrigerator—No. 2 for 25 men or less; No. 1 for 26 to 50 men.
(b) One or more steam tables.
(c) One 5-gallon steam coffee urn for from 20 to 50 chief petty officers.
(d) Two 5-gallon steam coffee urns for over 50 chief petty officers.
(e) For capital ships, carriers and cruisers, one single-tank dishwashing machine and one dishsterilizing tank.

(15) Wardroom:
One electric drinking fountain for capital ships, carriers, cruisers, tenders, repair ships, and transports. (No. 1 for up to 20 officers, No. 2 up to 50 officers, and No. 3 up to 100 officers.)

(16) Junior officers' messroom:
One electric drinking fountain for capital ships, carriers, cruisers, tenders, repair ships, and transports. (No. 1 for up to 20 officers and No. 2 up to 50 officers.)

(17) Warrant officers' messroom:

One electric drinking fountain for capital ships, carriers, cruisers, tenders, repair ships, and transports. (No. 1 for up to 20 officers and No. 2 up to 50 officers.)

(18) Chief petty officers' messroom:

One electric drinking fountain for capital ships, carriers, cruisers, tenders, repair ships, and transports. (No. 1 for up to 20 chief petty officers, No. 2 up to 50 chief petty officers, and No. 3 up to 100 chief petty officers.)

(19) General mess issuing room:

One coffee grinder, electric, for complement over 200.

(20) Crew's spaces:

Electric drinking fountain—one No. 4 for each 200 men; one No. 5 for each 300 men.

14

The upkeep and operation of modern ranges are covered in **Ranges**. Section III.

15

(1) Potato peelers have a hopper with abrasive wall and an **Potato peelers**. abrasive rotary disk in the bottom. The latter has humps which agitate the potatoes so as to present new surfaces to the abrasive material which is cast into the metal. The motors are of the water-tight type, mounted above the hopper so as to avoid grounding from spray. The 15-pound and 25-pound machines with one-half or three-fourths horsepower motors are started by fused line switch. The 50-pound machines with 1½-horsepower motors are provided with panel type starter.

(2) These machines should be started before being charged with potatoes, otherwise the motors would be overloaded in accelerating the mass. A spray of water is provided at the machine which should be turned on when starting the machine. The useful life of the abrasive surfaces may be extended by occasionally:

- (a) Reversing the direction of rotation of the motor and disk.
- (b) Burning the vegetable matter from the abrasive surfaces with a gasoline blow torch.
- (c) Lubricating all bearings adequately, especially in view of the presence of grit removed from vegetables.

16

Kitchen and cake machines are provided with 30-quart and **Kitchen and cake machines**. 80-quart bowls and necessary accessories to permit the mashing of potatoes, mixing of soup, whipping of mayonnaise, mixing of cake dough, etc. Proper speeds are afforded by gear shift. These machines are capable of mixing 150 pounds of bread dough and are issued to certain naval auxiliaries in lieu of dough-mixing machines, in which case they are provided with meat-chopping attachment.

Meat choppers. Meat choppers are of the usual commercial type, with a hopper and a worm which feeds and forces the food through a perforated plate against which rotates a disk-type knife that chops the food.

Dough mixers. Dough mixers are gear driven by an inclosed motor. A hand-wheel is provided for tilting the trough so as to facilitate removal of the dough into truck tubs. For this purpose machines are high enough or mounted on a platform of sufficient height to permit the dough to flow readily into the truck tub.

On recent machines a safety switch is installed so that the agitating device is inoperative when the tank is tilted about 6 inches from its vertical position unless the switch is held in manually.

The practice of some bakers of cutting the dough while the mixer arm is revolving so as to prevent its winding up on the mixing arm should not be followed as casualties may thereby result.

Air compressors. Air compressors for supplying air for the atomization of fuel oil in certain types of galley ranges and incinerators are provided with automatic controllers adjustable so as to start and stop the compressor at predetermined air pressures at the receiver. The operating pressure at the burners is from 15 to 29 pounds. Owing to the frequency with which the pressure controllers operate, considerable trouble has been experienced with the large compressors due to arcing at the main line contactors. The contacts should be frequently inspected and cleaned.

Bake ovens.

(1) Bake ovens are generally of the electric type except on auxiliary vessels and small vessels where generator capacity is inadequate. Owing to the absence of grease and the moderate temperatures employed, no special difficulty has been experienced with the life of the heating elements.

(2) Some types are provided with the heating elements concentrated in the base of the oven. A flue is provided at the back of the shelves up to which the heated air passes, then through adjustable openings over each shelf toward the front, where it passes downward, being accelerated by the leakage of cold air from the doors. The adjustable openings permit uniform temperature on all shelves.

(3) Other types of ovens have distributed heating elements at each shelf, with individual control switches so as to afford uniform temperature. Each shelf in this type of oven is provided with a thermometer. The ovens should be heated to 450° F. before inserting the dough. Forty minutes is the usual time required to bake bread. These ovens are also useful for baking pies, beans, etc.

(4) After baking temperature is reached the controller should be moved to the medium or low heat position to conserve power, reduce room temperature and prolong the life of the heating units.

21

Proofers to facilitate raising the bread dough are heated by Proofer. steam coils.

22

Electric warming ovens are provided on older destroyers for **Warming oven.** keeping the officers' food warm after being cooked in the galley. These were found desirable for use of the watch force and in general for warming food owing to the distance of the galley from the wardroom and the necessity for transporting the food over an open deck, with consequent rapid cooling.

23

(1) A spray type dishwashing machine in which dishes are washed by passing them in baskets through the machine as water is sprayed under pressure, both from above and below, is provided in the general mess pantry. The baskets pass successively under washing and rinsing sprays.

It has been found that trisodium phosphate or washing compounds containing trisodium phosphate are more satisfactory detergents than soap powder as they do not foam. Soap foam reduces the force of water striking the dishes as well as the quantity of water pumped. It is therefore suggested that trisodium phosphate as covered by Federal Specifications 0-T-671 be used in dishwashing machines.

As the quantity required will vary with the temperature and hardness of water, it is suggested that one ounce of trisodium phosphate be used for each three gallons of water in the wash tank and small quantities added, if necessary, until the water has a soft velvety feeling when rubbed between the fingers. If too little or too much trisodium phosphate is in the water the effect when rubbing between the fingers will not be as smooth as when the correct quantity is used.

A small amount of sodium silicate added to the washing solution has been found to remove marks on dishes where contact is made with the dishwashing baskets. Four ounces of sodium silicate should be added to the wash water for trial purposes and the quantity increased or decreased as conditions may warrant.

In order to facilitate the removal of food from dishes, water in the wash tank should be maintained as near 120° F. as practicable. The water in the rinse tank should be about 200° F. Federal Specifications OO-M-31 require thermometers to be installed on each tank so that the temperatures may be readily determined.

(2) It has been determined that dishwashing machines under the best conditions can only clean dishes and not sterilize them. For this reason sterilizing machines with steam coils are provided as previously specified under the heading "General Mess Pantry," in which the dishes are to be immersed for at least one minute. Dishes in baskets when removed from the dishwashing machine are to be lowered by an overhead trolley on to one end of the conveyor in the sterilizing tank which carries the dishes while submerged in water, near the boiling point, to the other end of the sterilizer where they are to be removed by means of an overhead

Dishwasher and dishsterilizer.

trolley. The speed of the conveyor is such that at least one minute is required for the baskets to pass through the sterilizing machine. The speed of the conveyor may be adjusted by means of the motor control panel. In order to ensure sterilization of the dishes, the water should be maintained at about 212° F. and the dishes submerged for at least one minute.

Small one-tank dishwashing machines when provided are installed near a small tank with steam coil or mixing valve. The tank is intended for submerging the washed dishes in boiling water for at least one minute for sterilization purposes. A similar tank without the dishwashing machine is provided for destroyers of smaller than the 1,500-ton type.

The temperature attained by the dishes in this tank insures their quick drying when they are removed.

It is desirable to discourage the washing of dishes at the mess tables.

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Steam jacketed kettles.

(1) Steam jacketed kettles are furnished with relief valves set at 40 pounds per square inch and the kettles should never be subjected to steam pressure in excess of 40 pounds per square inch. Any excess pressure may result in serious damage to the kettle and injury to personnel. Information from the manufacturers indicates that only 8 minutes are required to bring a 40-gallon kettle to boil from 52° F., using steam pressure of 35 lbs. per square inch.

(2) The insides of aluminum steam jacketed kettles may ordinarily be kept clean by the use of pure soap and hot water. The outside may be kept bright by use of any metal polish that is not gritty and that does not contain alkali. Never use soda, lye, ashes, ammonia or any washing powder or soap containing alkalies, as all such materials injure or discolor pure aluminum.

SECTION III. GALLEY RANGES

25

(1) Old-style Navy standard oil-burning ranges are not provided on new vessels and when present stock is exhausted, these ranges will be replaced with other types. Instructions covering the old style ranges are given in the pamphlet "Instructions for Installation and Operation of Navy Standard Oil Burning Ranges," edition of April, 1922. In view of the above and in view of the fact that the bureau feels that the forces afloat are thoroughly familiar with the care and operation of these ranges, it has been decided to omit further reference to such ranges in this pamphlet.

(2) The following types of modern ranges are installed on the various classes of naval ships:

- (a) Carburetor type, oil burning.
- (b) Mechanical type, oil burning.
- (c) Electric.

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(Carburetor type)

Description.

(1) This type of range is operated without steam, compressed air, or mechanical burners. The oil is arranged to flow by gravity into the carburetor, which consists of a large steel cylinder per-

forated by a number of holes, the size and spacing of these holes being such as to admit the proper quantity of air. The oil drips into this carburetor where it is converted into a gas and delivered to the combustion chamber directly over the carburetor. This type of range is furnished in two sizes, i. e., one oven and two oven. Each size of range is provided with a single burner.

(2) In order to insure proper draft, care should be taken to see **Draft**. that all joints in smoke pipe are tight and that the smoke pouch leading up from the bottom of the range to the smoke pipe is securely cemented and bolted in place. The connection between the top plates and the body of the range should be kept air-tight to prevent air entering the range under the top plates. If top plates should draw apart, the tie straps on the under sides of same should be removed, the top plates brought close together and secured with new straps. If the top plates should crack the cracks should be filled with cement. Any inflow of air through or under the top plates will cause the top to cool and retard the fire.

(3) To light the burner, place burning paper or waste in the car- **Lighting off**. buretor, then open oil valve and allow a small quantity of oil to run into carburetor. Be sure oil is ignited. Always light off the paper or waste in the carburetor before opening the oil valve. Never put oil into a hot carburetor and apply fire afterwards. The oil valve should be kept turned down low until the carburetor heats up. Kerosene, gasoline or similar fuels should never be used to accelerate the heating of the range.

(4) The fire may be controlled by the rate of flow of oil into the **Control of fire**. carburetor. The damper should be closed until smoke just begins to appear when using the maximum fire required. The fire should never be increased beyond this point without further opening of the damper to increase the draft, otherwise there will be a dense smoke, a large accumulation of soot in the flues and serious damage to the range from overheating. To save fuel the damper should only be opened enough to prevent smoking. This type of range requires more time to attain working temperatures than other types of ranges and therefore there is a tendency on the part of the operators to attempt to decrease this time by increasing the flow of oil until the carburetor becomes flooded. Under such conditions, the temperature of the range will continue to rise until all the oil in the carburetor is consumed and may result in overheating and consequent damage to range tops, etc. If excessive time is required for heating up the range, close the damper a little more to hold the heat in the range, and increase the flow of oil, but be careful not to feed the oil too fast.

(5) The carburetor must be kept in proper position. The hole **Carburetor**. in the cast-iron top of the carburetor must be exactly in line with the hole in the cast-iron bottom of the fire box. The gap between the top of the carburetor and the bottom of the opening of the fire box should be uniform all around in order to obtain proper combustion. The carburetor should be withdrawn once in every 24 hours and cleaned thoroughly. To clean the carburetor turn off the oil and allow the fire to die out. As soon as fire is out, pour through the oilway about 1 quart of water. Allow this water to remain there about five minutes; then withdraw the carburetor and turn same upside down and the residue will practically all fall out. Any residue remaining in the carburetor may be

scraped out. The carburetor should never be allowed to cool before cleaning. If allowed to cool, the residue will harden and it is then very hard to remove and is liable to damage the carburetor. If fire is slow in rising out of the carburetor, close the damper about one-third; this will raise the fire. If fire should burn to one side of the carburetor, it is probable that the carburetor is not in proper position relative to the opening in the bottom of the fire box. If carburetor should be flooded while burning, shut off the oil feed and remove the small round top plate; this will allow the excess amount of oil to burn out and prevent the fire from puffing back through the carburetor holes. If carburetor should flood while cool, remove carburetor and empty the oil before attempting to light. If smoke puffs out of carburetor, partly close the damper, if it is open, and remove the small round top plate for a short time.

Ovens.

(6) If oven is too hot on top, open top of oven door one notch. If oven is too hot on bottom, open small ports at bottom of range and clean out the flues to allow a free circulation.

Top of range.

(7) If top of range at farthest end from fire box does not heat, see that top flues over oven are clear, then open damper for a few minutes to start a fast flow of fire from fire box. After leaving open for a few minutes, close again. This will check the heat and cause it to bank at the far end of the range, thus increasing heat on top plates.

Construction of bottom, top, sides.

(8) (a) Bottom of range consists of double thickness of sheet steel with asbestos board between.

(b) Top plates are of heavy French type to permit frying on top of range without using pans. The top plates are graduated in thickness from about $1\frac{3}{4}$ inches over fire box to about three-fourths inch at opposite end of range to insure more even distribution of heat. The edges of top plates are accurately planed to insure a perfect joint between plates and the top plates are connected to each other by tie-rods to make a tight joint and prevent inflow of air.

(c) The top, sides, and bottom of ovens are made of sheet steel. Between adjacent ovens there is provided a space about $4\frac{1}{2}$ inches wide which insures an even distribution of heat. This space is closed at the top with a pan filled with asbestos cement, this closing arrangement being necessary to prevent short-circuiting the heat. The oven tops are insulated with $\frac{1}{4}$ -inch asbestos board secured with bolts and washers. Over this asbestos a heavy cast-iron stay is fitted the full length of the ovens and securely bolted to the ovens to prevent any buckling or warpage of oven tops.

(d) Heavy cast-iron liners are fitted inside the top flue at both front and back of the range and securely bolted to the body. These liners are so designed as to form a cup at the top of the range and the space is filled with asbestos cement which provides a bearing for the cast-iron top and prevents leakage between body and top. In repairing or replacing top plates care should be taken to make all joints tight to prevent inflow of air into the top flue.

(e) The fire-chamber lining may be made up of a combination of standard fire brick and plastic fire brick. Asbestos insulation is fitted to the side walls and bottom of the fire chamber except on the oven side.

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(Mechanical burner type)

(1) This type of range is furnished with either one or two ovens. A single fire box is provided located on one end of the range and fitted with an electrically operated mechanical burner. The top of the range is made up of four or five heavy plates which permit frying directly on the top of the range without using pans.

(2) (a) Oven temperatures suitable for baking can be maintained **General care.** without the top plates becoming red hot.

(b) Burnt grease will accumulate on the edges of the top plates and should be removed at frequent intervals. Expansion joints have been provided between the extension plates and range top which will allow for normal expansion due to heat, providing the edges of the top plates are kept free from burnt grease, the accumulation of which makes the range top longer.

(c) Carbon deposits should be brushed out of the fire box to insure proper combustion of oil. Horizontal flue over ovens, down flue, oven bottom flue, and back flue or smoke box should be cleaned at regular intervals in order that the proper draft be maintained. By removing the oven bottom plates the oven bottom flue can be cleaned more thoroughly than through the clean outs under ovens. The down flue is lined with asbestos and should therefore be cleaned with a brush to remove soot. "Clean-out" slides under fire box should be closed at all times, otherwise cold air will be supplied for combustion.

(d) Top plates and range body should not be cleaned with lye and water. Grease should be removed from range body with kerosene or other noncorrosive grease solvent, and from top plates by wiping off with cloth, using steel wool for polishing when necessary.

(e) Expansion joints have been provided in the smoke pipes and should be inspected if smoke pipes fail to hold their original shape.

(f) Smoke pipes should be cleaned at regular intervals.

(g) A drip pan is provided so that unburned oil inadvertently admitted to the fire box will drain to the front of the range, where it can not cause general conflagration.

(h) The inner casing of the range body is made up of a number of pieces so that any part of the inner casing and asbestos insulation may be removed without disturbing the adjacent casing should occasion require renewing.

(i) Drain holes will be found on the outboard side of range foundations at top of tile, which will allow water that may accumulate under range to drain off. These holes also permit directing a stream of hot water under the range occasionally to maintain sanitary conditions.

(3) (a) See that oil supply valve to burner is open.

To light burner.

(b) Swing burner in firing position and close or latch it. See that oil valve on burner is closed. This will prevent oil from reaching the fire box before the operator is ready to light off the range. Push the button of electric switch marked "start" and

allow motor to reach maximum speed and oil to reach the required pressure. If the current has been shut off by reason of power failure, push re-set button before pushing starting button.

(c) Open lid on range top and light a large piece of paper or oily waste and place it in the center of the fire box directly in front of burner nozzle.

(d) Open oil valve on burner slowly until fire burns steadily. After fire box has warmed up, regulate flame to desired size.

(e) *Caution.*—If oil fails to ignite do not start burner with a fire box full of vapor or unburned oil as this may result in an explosion.

(4) (a) Close oil valve on burner.

(b) Allow motor to run two minutes to throw oil out of cup.

(c) Open electric switch which will stop motor and pump.

(d) Unlatch burner and swing out of the firing position when motor has stopped. This will prevent nozzle from being damaged by heat. While in this position wipe off the nozzle and atomizing cup with a coarse rag. This cleaning is absolutely necessary.

(5) If the electric current to motor fails for any reason the switch will automatically open and remain open until the starting switch is again operated. The magnetic valve which controls the oil supply to burner will close and flame will be extinguished. Always light off range with flaming waste or paper when motor is again started, to avoid accumulation of explosive gases.

The overload release is of the thermal type and should the electric current be shut off, due to overloading motor, allow release to cool before starting, otherwise switch will not stay closed.

The burner should be inspected for lubrication once each week. Lubricate burner by pouring a good grade of medium oil in the upper oil cup until it shows within a quarter of an inch of the top of the lower cup. Lubricating oils should not be put in the burner while it is in operation as the lower cup will give various readings of amount of oil that is in the gear housing, which may be found to be incorrect when the motor has stopped. Oil should be entirely renewed every two months. Remove plug in bottom of gear case, drain, wash with kerosene, replace plug, and refill with new oil.

Inspect brushes and clean commutators regularly when direct current motors are used. Clean fan and air jacket around motor occasionally.

Some burners are supplied with a fuel tube in center of shaft. If this tube rattles, adjust by means of the four screws on tail piece of burner.

See that gland nuts on the hinges and valves are tight at all times.

Keep the nozzle clean; make it a habit to wipe off the nozzle and atomizing cup each time the burner is shut down or at least once every twenty-four hours. Nozzles containing angular vanes should be removed in order that they may be cleaned properly.

Clean strainers once each week or as often as required depending upon the cleanliness of the oil used. Unscrew cap and remove basket strainer and wash with kerosene. Supply tanks should be cleaned at frequent intervals.

The oil and air supply to burner is regulated for maximum efficiency for the oil used at the time of installation and should not be

**To shut off
burner.**

**Burners, general
instructions.**

changed. If, however, it becomes necessary to adjust these valves see instructions for the type of control valves used, furnished with the burner.

(6) In burners with oil pump incorporated as an integral part **Pump-type burners.** of the burner, the oil pressure should be set at 30 pounds which is the correct pressure for bunker C oil of average gravity at 60° F. If a greater or lesser pressure is recorded on the gauge after use, reset relief valve by using key furnished for the purpose. Operate burner on as low oil pressure as possible. If the oil pressure is too high the burner will not operate successfully and the flow of oil to the nozzle can not be controlled easily. If a fuel-oil heater is supplied, 15 pounds oil pressure will be sufficient with oil at 120° F.

When the pump on one burner is connected so as to supply other burners and the oil pressure is set at 30 pounds with all burners running, slightly higher pressures (about 35 or 40 pounds) may be recorded on the gauge of a pump with but one burner running. If cold oil is used, a greater pressure than 30 pounds may be found satisfactory, while less pressure will be found desirable with warmer oil. Increasing pressure unnecessarily will cause more oil to flow into the burner than is required for heating the range tops and ovens in a reasonable length of time with the result that the top plates will become red hot and sag.

Relief valves should be changed gradually or a broken oil gauge and blown out fuses may result.

It is suggested that the cook in charge of the galley regulate the oil pressure and keep the keys for the relief valves in his possession.

The pipe plug nearest nozzle on supply line from pump may be removed to determine if magnetic oil valve is functioning. Cold oil may run very slowly in this line when burner is first started.

If oil pressure does not show on gauge in three minutes after the motor has been started, feel pump shaft to see if pump is working, then check oil supply in tank. After the tank has been filled the pump should pump the air out of the supply line; if not, clean strainer on suction line and fill with oil, replace cap and be sure that it is screwed down tight. If tank is full and all burners can not be supplied with oil, remove pipe plug provided at the highest point in suction line near oil tanks and allow air to escape.

Should the gauges not show a pressure of about 30 pounds in three minutes after the motor has been started, or if this pressure drops immediately after the oil valve on the burner has been opened, check suction line for airtightness, especially strainer cap, gland nuts on hinge, unions, and other fittings on suction side of pump.

The vent at top of oil tanks should be open at all times.

If supplied with an oil heater and the temperature exceeds 120° F. close steam supply to heater and allow oil to cool before adjusting regulator. See detailed instructions for regulator installed, furnished with the burner.

If for any reason the pump on a burner fails to supply the necessary oil pressure after the relief valve has been properly regulated and the supply of oil to burner checked as before described, remove gears from the pump if found defective, and if repair parts are not available, place cover on gear box and operate burner by making the following change: Remove pipe

plug from burner piping between hinge and gauge and connect similar fitting on nearest burner with a pipe or flexible tubing. This line, if installed permanently, should contain a valve in order that each burner may be operated independently when repairs are completed. Relief valve on defective burner should be adjusted to prevent oil returning through it and oil pressure to both burners should be regulated by relief valve on burner supplying oil. Close supply valve to pump if check valve on suction line to defective burner does not hold oil pressure. CAUTION: The bearings on the pump type burners are supplied with oil by the worm gear, and, if removed, the oil supply in the gear must be raised to the level of the shaft if burners are to run very long before overheating. If worm gear is removed, remove worm from shaft and provide oil ring to lubricate bearings.

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**Construction
and repair of
ranges of me-
chanical burner
type.**

(1) The mechanical-burner type ranges are designed so that repairs can be made at a minimum cost aboard ship if necessary.

(a) The refractory lining is composed of a silicon carbide refractory tile, which will stand practically 3,000° F. heat and possesses a peculiar quality of reradiating heat into the fire box, being insulated from all metal parts of the range by a wall of diatomaceous earth. This further allows the fire box to expand and contract without undue strain. The casing of the fire box is composed of an inner casing of sheet steel 0.0781 inch thick, a center lining of one-fourth inch of mill board asbestos, and an outer casing of sheet steel 0.0781 inch thick.

(b) The center of the burner is located low in the fire box in order to more closely parallel the effect of a coal fire. This allows the heat to be carried around the ovens by the natural draft, the same as in a coal range, thus permitting the even heating of all ovens, the arrangement of combustion chamber providing a fire wall on which the oil fog from the burner may be directed. The secondary superheated air introduced into the fire box through a port in the hearth insures a clean, quiet fire. The position of the burner nozzle in the fire box as installed has been shown by test to be the most satisfactory location for the type of cooking done aboard naval vessels and should not be changed.

(c) Dampers are not used as they are dangerous. In the event of a flareback or oil explosion, the top plates, not being bolted down but held in position only by their own weight, may move without seriously affecting the range.

(d) The one-half inch asbestos insulation on the walls of the down flue may be renewed by removing the washers and bolts which secure it to the casing. Should the inner casing or one-fourth inch asbestos center lining between the outer and inner casings require renewing, see sheet 1, C&R Drg. 156159. This drawing gives the location of laps on inner casing so that the portion requiring renewing may be removed without disturbing the adjacent casing.

(e) In replacing the range lining above the silicon carbide tile in the fire box and fire bricks over ovens, care should be exercised

in order that all exposed surfaces of angles and casing be covered with plastic fire brick. Split fire bricks should be used over ovens. These should be laid up with a minimum amount of fire clay. Dry ranges after relining by firing with wood for about five hours before using oil.

(f) Fire-box linings are of long-life, heat-resistant silicon-carbide refractory tile, which, after a few hours use, presents a dark color. Under normal circumstances these tile will give not less than three years satisfactory service before replacements are necessary. Replacement of these linings should not be attempted by ship's force if avoidable. If replacement is attempted, the exact original size and shape of the fire box should be adhered to.

(g) The range top plates are made from special high grade castings containing a certain percentage of chromium and nickel to lend tensile strength under the high temperatures to which they are subjected. Tests of ranges conducted at the navy yard, Puget Sound indicated that the temperature of the hottest plate need not exceed 750° F. when a baking temperature of 500° F. is maintained in the ovens. Sagged plates may be straightened by heating to the same temperature that caused them to sag and pressing them back into shape. Care should be exercised in heating in order that they do not crack when pressure is applied. This work should preferably be done at the yard.

(h) The rotary type burners used with the ranges accomplish atomization by the open cup method, that is, oil enters the inside of a conical cup and is atomized by a combination of air and centrifugal force. Oil sprayed in minute particles from the rim of the revolving atomizing cup, which is surrounded by air discharged at low pressure in a direction parallel to the axis of rotation, is carried as a vapor into the fire box. The amount of air necessary for complete atomization is supplied by the fan on the burner. The secondary superheated air supplies the remaining oxygen necessary for proper combustion. Care should be taken to avoid damage to the rim of the atomizing cup, as it must be sharp, polished, and absolutely true. In order that the burner may function as intended, the speed must remain at 3,450 r. p. m.

(2) Suggestions if mechanical burner ranges fail to function satisfactorily: Operating suggestions.

(a) If oven temperatures suitable for baking can not be maintained without the top plates becoming red hot the following is suggested:

See instructions under care and operation, noting especially the paragraph regarding the cleaning of carbon deposits, etc.

Clean burner nozzle, fan, and air jacket around motor.

Check speed of motor. It should be not less than 3,450 r. p. m.

Oil pressure normally should not be more than 30 pounds.

The smoke pipe leading from the range to the atmosphere should be examined for rust holes or broken joints, particularly that portion running up the main stack.

Good natural draft is important. Check all flues for size and obstructions. Bends should be large and of minimum number.

(b) Should ranges or burners fail to function properly after the above has been done, notify home yard of the ship and state in detail the facts regarding each range or burner, giving the manufacturer's name and serial number. If no serial number is obtainable give the contract number and position in galley.

(Electric ranges)

Ships equipped with.

(1) It is the policy of the bureau to equip capital ships, carriers, heavy cruisers, and submarines with electric ranges in sizes dependent upon ship's complement, as described in article 13.

Advantages and disadvantages.

(2) Such ranges have certain inherent advantages over oil-burning ranges in that they permit of better conditions of cleanliness, they are absolutely silent in operation, and constitute somewhat less of a fire hazard. The fact that there are no flue gases to be disposed of makes it practicable to locate galleys well below decks if necessary. On submarines the use of electric ranges, particularly during submerged operations, is of course indispensable. On the other hand these ranges are considerably more expensive to operate and require the outlay of a larger electric power plant on board ship.

General description.

(3) (a) The heavy duty marine types of electric ranges as marketed by various manufacturers are used in the service. In general the ranges are controlled from the front by means of switches providing high, medium, and low heats for each heating unit and arranged so that for repair purposes it is not necessary to gain access to the sides or rear of the ranges. On submarines it has been found expedient to place the switches on a bulkhead or in any other location convenient to the range but out of the way of the range proper. Substantial screw or bolt electrical connections are provided so as to facilitate removal and installation of hot plates and heating units. Lead wires are brought to the front of the range and connected to a terminal board and fuse blocks. Hot plates are constructed so that boiling water may be poured over them for cleaning purposes and a slot is provided around hot plates to drain grease and liquids to removable scavenger pans below. These drains should be kept clean.

Broiling arrangements.

(b) Broiling arrangements differ. On some types the broiler, or salamander as it is called, is portable and when in use is mounted in the rear of the range over the top hot plates. In other cases a separate broiling compartment is fitted adjacent to the baking oven. Drip pans are provided to catch the grease from broiling meats.

Ovens.

(c) Recent types of ovens have separately controlled top and bottom heating units in order to provide uniform oven temperature. The energy input will raise the temperature of the empty oven 215° C. in about 25 minutes. The minimum input will maintain the oven at about 115° C. above room temperature.

Heating units.

(d) Heating units are of the inclosed conduction type in order to avoid oxidation of the elements from salt atmosphere and to prevent grease, food, and liquids from being spilled upon the wires.

Operation.

(4) Any data plates on the ranges, such as warnings as to proper operation of heat controlling switches, should be observed. The

use of high heat should be restricted to bringing the oven, broiler, and hot plates up to operating temperature and is not necessary under most circumstances for actual cooking. Medium heat and low heat should be used as necessary to maintain operating temperature. This procedure will conserve power, reduce room temperature, and prolong the life of the heating units. Hot plates are capable of operating at a temperature of 730° C. without detrimental oxidation. Hot plates are arranged so that the energy input is evenly distributed over the plate and will produce a temperature rise of about 300° C. in one hour.

(5) It is important that electric ranges be kept clean and free care from grease, food particles, and dirt. Grease on terminals soon carbonizes and causes failure of heating units at the terminals, due to corrosion, shorts, and grounds.

SECTION IV. MEDICAL APPLIANCES

30

Medical appliances are provided by the bureau for vessels as follows: *Allowance of medical appliances.*

Disinfectors:

One for capital ships, aircraft carriers, transports, and tenders.

Two for hospital ships.

Disinfectors, portable, sack:

One for transports, cruisers, gunboats, fuel ships, and cargo ships.

Sterilizers, combination, steam:

One for tenders, transports, and cruisers, if electric type is not provided.

Sterilizers, combination, electric:

One for capital ships, aircraft carriers, and cruisers.

Sterilizers, instrument, electric:

One for each battle dressing station except where combination sterilizer is used.

One for destroyers having a medical officer.

Containers for sterilized dressings, electric, with stand:

One 4-container type for capital ships and aircraft carriers with two battle dressing stations.

Hot and cold water sterilizers, 8-gallon, steam:

One for each combination electric sterilizer. (Two 8-gallon tanks.)

Water heater, electric, 24-gallon:

One for each battle dressing station.

Incubator, bacteriological, electric:

One for each capital ship, aircraft carrier, and cruiser.

31

After closing all valves, the disinfecter is operated as follows:

Operation of the disinfecter.

(1) Run loaded car into chamber and close door.

(2) Open top and bottom suction valves to chamber to allow air to escape from the chamber.

- (3) Open wide the globe valve in main steam supply and high-pressure globe valve to jacket slightly to admit steam to jacket, allowing disinfecter to warm up gradually.
- (4) Open globe valve in ejector steam supply to create vacuum in chamber, and when pressure vacuum gauge to chamber shows 15 to 20 inches close the top and bottom suction valves to chamber; also globe valve in ejector steam supply.
- (5) Open angle valve in steam supply to chamber to admit steam through reducing valve (approximately 15 pounds pressure) to chamber.
- (6) Expose contents to steam pressure for 30 minutes (longer if densely packed), in the meantime seeing that the trap to drain jacket is working properly to allow condensation to drain from the jacket.
- (7) Open globe valve to drain chamber occasionally to drain condensation from the chamber and promote steam circulation.
- (8) After the desired exposure, close angle valve in steam supply to chamber; open globe valve to drain chamber, then top and bottom suction valves to chamber, and when the pressure gauge to chamber shows no pressure close globe valve to drain chamber and open globe valve in ejector steam supply to create final vacuum (approximately 15 inches).
- (9) Close top and bottom valves to chamber and globe valve in ejector steam supply.
- (10) After 5 or 10 minutes (depending on density of load), open up filter and vacuum breaker to break vacuum.
- (11) Open the door and remove the contents.

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Instructions for formaldehyde disinfection.

The operation of formaldehyde disinfection, with or without steam in jacket, for such articles as might be injured by heat or steam, is performed as follows:

- (1) Place 40 per cent formaldehyde solution in the cup for retaining formaldehyde. After creating 15 to 20 inches vacuum, as described above, close top and bottom suction valves to chamber and globe valve in ejector steam supply.
- (2) Open globe valve in generator steam supply (two turns) and globe valve to drain generator slightly to drain condensation.
- (3) Open valves in formaldehyde solution cup, closing as soon as solution has been drawn into chamber. Allow sufficient time for disinfection, according to the contents.
- (4) Create final vacuum (about 10 inches), as described above, and with ammonia in ammonia cup (globe valve in generator steam supply and globe valve to drain generator being open, as stated above), open valve to ammonia cup, admitting ammonia to generator and its gas to chamber, neutralizing the formaldehyde.

33

Sterilizers.

- (1) Steam for dressing sterilizers is generated by an independent heater either steam or electrically heated. In some makes an ejector is provided for creating a partial vacuum within the sterilizing chamber, after which steam should be admitted to provide moist heat.

The dressing sterilizer should be heated until a sterilizing temperature of 250° F. is attained. After this temperature is reached it should be maintained in the sterilizing chamber for at least 30 minutes to ensure sterilization.

(2) Steam heated water sterilizers of 8 and 10 gallons capacity should be operated at least 20 minutes in order that the water may be heated to 250° F. and maintained at that temperature for at least 30 minutes.

Utensil sterilizers, 20 by 15 by 16 inches, as usually furnished for shipboard use, should be heated until the water boils. This requires about 10 minutes if steam heated and about 40 minutes if electrically heated. Utensils should remain in boiling water for at least 5 minutes.

Instrument sterilizers should be heated until the water boils, about 10 minutes being required to do so for the 16 by 8 by 6 inch sterilizers. Instruments should remain in boiling water for at least 5 minutes.

Electrically heated sterilizers are provided with three heats so that when water boils reduced heat may be used to maintain the boiling temperature.

(3) In order to avoid burning out heating elements, electrically operated sterilizers, including dressing, instrument and utensil sterilizers, should never be operated unless water is well above the heating elements. The water level should be checked frequently and always before turning on the heat.

(4) Containers for sterilized dressings are provided so that dressings may be sterilized and stored in the containers. On capital ships and aircraft carriers a container stand is provided with an electrical heater for heating the dressings.

SECTION V. SHOP APPLIANCES

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Shop appliances generally as listed below are furnished capital ships, aircraft carriers, and tenders by the bureau for use of the Capital ships, aircraft carriers, and tenders. carpenters, ship fitters, plumbers, and sailmakers:

- One band saw, 30-inch, electric.
- One saw table, 12-inch, electric, variety type.
- One wood lathe, 16-inch, electric.
- One drill press, 23-inch, electric, or 1½-inch radial drill, bench type, electric.
- One grinder, 2-horsepower electric, floor type.
- One planer and jointer, 4-inch portable, electric.
- One wood trimmer, hand.
- One tinsmith former, hand.
- One tinsmith turning machine, hand.
- One sheet metal folder, hand.
- One tinsmith wiring machine, hand.
- One shears, hand.
- One key cutting machine.
- One stencil cutting machine.
- Two drills, portable, pneumatic, 1½-inch.
- Two drills, portable, pneumatic, ½-inch.
- One drill, portable, electric, ¼-inch.

One drill, portable, electric, $\frac{3}{8}$ -inch.
 Two drills, portable, electric, $\frac{1}{2}$ -inch.
 Two hammers, portable, pneumatic riveting.
 Two hammers, portable, pneumatic, scaling.
 Four hammers, portable, pneumatic chipping.
 One glue pot, electric.
 Two soldering irons, electric, light.
 Three soldering irons, electric, medium.
 Two soldering irons, electric, heavy.
 One sewing machine, electric, heavy for canvas work.
 One sewing machine, electric, light.
 Two sewing machines, hand, for flags.
 One punch, lever, hand.
 One shear, serpentine for destroyer tenders.
 One mortiser for destroyer tenders and repair ships.
 One saw-filing machine for tenders and repair ships.
 One tenoner for destroyer tenders and repair ships.
 One large planer and jointer for *Saratoga* and *Lexington*.

Power tools should be operated only by capable authorized operators. Before starting a machine be sure all guards for moving parts are in position. Do not operate a tool from a position such as back of a saw blade where the operator can not fully see his hands and the work.

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Cruisers.

Tools generally as listed below are furnished to cruisers:
 30-inch band saw or 12-inch variety type saw table.
 Bench grinder, 1 horsepower.
 4-inch planer and jointer.
 One stencil cutting machine.
 One $1\frac{1}{4}$ -inch radial drill, electric, bench type.
 One $\frac{1}{4}$ -inch electric drill.
 One $\frac{3}{8}$ -inch electric drill.
 One $\frac{1}{2}$ -inch electric drill.
 One glue pot, electric.
 Two electric scaling hammers.
 One soldering iron, electric, light.
 One punch, lever, hand.
 One shear, hand.
 One sheet metal folder.
 One sewing machine, electric, heavy for canvas work.
 One sewing machine, hand, for flags.

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(1) The following tools are generally furnished auxiliary vessels and destroyers:

Auxiliary vessels.

Two chipping hammers, pneumatic.
 One drill, $1\frac{1}{4}$ -inch, pneumatic.
 One drill, $1\frac{1}{4}$ -inch, electric, portable, radial.
 Three drills, portable, electric, one each, $\frac{1}{4}$ -inch, $\frac{3}{8}$ -inch, and $\frac{1}{2}$ -inch.
 One grinder bench, electric, 1 horsepower.
 One soldering iron, electric, light.

- One sewing machine, hand.
- One stencil cutting machine.
- (2) A special allowance of tools is made to repair vessels. Repair vessels.
- (3) One hand sewing machine, one one-quarter horsepower **Destroyers**, aerial buffer and grinder, electric, and one scaling hammer, electric, are furnished to destroyers.

SECTION VI. GARBAGE INCINERATORS

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(1) Various types of garbage incinerators are provided on Naval vessels. The latest type, which is found on new vessels, is provided with a combustion chamber and a drying chamber. The drying chamber is over or adjacent to the combustion chamber so that hot gases from material burning in the combustion chamber will pass over the wet garbage in the drying chamber before entering the smoke pipe. In this way the wet garbage is thoroughly dried out before being pushed into the combustion chamber. This type of incinerator has been found entirely satisfactory.

(2) Scrap wood, paper, etc., are burned in the combustion chamber, and where there is sufficient refuse of this type it is unnecessary to use the oil burner fitted in the combustion chamber.

(3) Garbage should be placed in drain troughs to allow free water to drain off before being placed in the drying chamber. Garbage driers similar to cider presses or centrifugal laundry driers have been tested and found unsatisfactory.

(4) In order to prevent the escape of sparks or burning pieces of refuse, all incinerators should be provided with spark arresters, the most effective type of which consists of a water spray or curtain fitted in the smoke pipe and through which all smoke and gases must pass. The spark arresters should be cleaned out as often as found necessary in order to insure proper operation. Especial care should be taken to prevent the escape of sparks or burning pieces of refuse when airplanes are on board the vessel, as experience has shown that such sparks will readily ignite the wing fabrics.

(5) Instructions issued by the manufacturers of the several types of incinerators in service should be carefully observed.

SECTION VII. COBBLER SHOP

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(1) Shoe-repair outfits consisting of one finishing machine, one stitching machine, and one patching machine are provided for capital ships, carriers, destroyer tenders, submarine tenders, and heavy cruisers. Shoe-repair
outfits.

(2) The finishing and stitching machines are operated by a common motor, while the patching machine is foot operated.

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The finishing machine includes the following articles: Heel **Finishing machine.** breaster, edge scourer, flat heel sander, bottom sander, brush, heel burnisher, edge trimmer, convex heel sander, and two ink cups.

An exhaust fan is fitted on the finishing machine and connected to piping extending to a hood with damper at each sander and scourer. The fan exhausts into a dust-tight box mounted on the machine. This box is provided with a handhole with dust-tight cover for cleaning purposes.

Stitching machine.

(1) The stitching machine is mounted on a power stand arranged for operation through a suitable clutch from the power shaft of the finishing machine. The machine is designed for making lock stitches of at least from 4 to 10 to the inch. Means are provided for changing the length of stitch and also for regulating the distance of the stitch from the edge of the sole.

(2) The stitching machine is provided with an electric heater arranged so that all required parts are uniformly heated and reach the proper working temperature within 25 minutes. A control switch is provided for regulating the heat.

Tools

(1) With each shoe repair outfit the following initial equipment of loose tools is provided: One pair of nippers, one pair of cutting nippers, one revolving nail dish, one large skiver, 6 assorted shoe knives, 6 assorted awls, 4 assorted hammers, 2 ink brushes, one jack for sitting work and one set of lap-lasts.

Spare brushes.

(2) Four sets of spare brushes are provided for the motor.

Supplies.

Expendable supplies and replacement of loose tools will not be provided from Government funds.

An exhaust fan is fitted on the finishing machine and connected to piping extending to a hood with damper at each reader and writer. The fan exhausts into a dust-tight box mounted on the machine. This box is provided with a bandbox with dust-tight cover for cleaning purposes.

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Stitching machine

(1) The stitching machine is powered over power stand arranged for rotation through a suitable chain from the power shaft of the finishing machine. The machine is designed for making book stitching of 16 lines from 4 to 10 to the inch. Means are provided for varying the length of stitches and also for regulating the distance of the stitch from the edge of the book.

(2) The stitching machine is provided with an electric heater arranged so that all required parts are uniformly heated and reach the proper working temperature within 24 minutes. A control switch is provided for regulating the heat.

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Tools

(1) With each shoe repair outfit the following basic equipment of tools tools is provided: One pair of nippers, one pair of crimping pliers, one revolving half-clamp, one large screw, 2 mounted knee braces, 6 assortments each, 4 assortments specimens, 3 sets brushes, one set for cleaning work and one set of box hammers.

(2) Four sets of spare brushes are provided for the marten.

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Supplies

Expenditure supplies and replacement of tools tools will not be provided from Government funds.

